

CLAIMS

1. A thermoelectric heat pump module comprising:

a plurality of spaced thermoelectric elements, the thermoelectric elements having first ends connected in pairs by electrically and thermally conductive cold-side connectors, the thermoelectric elements having second opposite ends connected in pairs by electrically and thermally conductive hot-side connector sinks having extended, spaced heat exchange portions forming a hot sink array, the cold-side connectors connected directly to and supported by a rigid, unitary cold sink.

2. The thermoelectric module of claim 1, further including potting material extending from the cold sink to a point beyond the cold-side connectors, the potting material sealing and supporting the first ends of the thermoelectric elements and the cold-side connectors.

3. The thermoelectric module of claim 2, wherein the potting material extends from the cold sink to a point beyond the second ends of the thermoelectric elements, the potting material enclosing the cold-side connectors, the thermoelectric elements, and base portions of the hot-side connector sinks.

4. The thermoelectric module of claim 2, wherein the cold-side connectors are connected to a support surface of the cold sink whose area is greater than an area bounded by the thermoelectric elements, and wherein the potting material is built up from the support surface to form a support for the thermoelectric elements and connectors.

5. The thermoelectric module of claim 4, further including a potting guide supported on the support surface of the cold sink and surrounding side surfaces of the potting material.
6. The thermoelectric module of claim 2, further including insulation above the potting material and above the second ends of the thermoelectric elements.
7. The thermoelectric module of claim 6, wherein the insulation is a foam type material.
8. The thermoelectric module of claim 7, wherein the foam type material extends from the potting material to a point above the second ends of the thermoelectric elements.
9. The thermoelectric module of claim 8, wherein the foam material is sealed against moisture.
10. The thermoelectric module of claim 2, wherein the potting material comprises an insulating material and extends to a point above the second ends of the thermoelectric elements.
11. The thermoelectric module of claim 1, wherein a potting guide is supported on the support surface of the cold sink surrounding the potting material, the potting guide including a raised potting support surface located above the TE elements and supporting a layer of potting material.

12. The thermoelectric module of claim 1, wherein the thermoelectric elements and their connector sinks are arranged in an elongated array of rows on the cold sink, the rows having a length greater than a width of the array.
13. The thermoelectric module of claim 12, wherein the elongated array is rectangular.
14. The thermoelectric module of claim 12, wherein the extended heat exchange portions of the connector sinks are parallel to one another.
15. The thermoelectric module of claim 14, wherein the extended heat exchange portions in one row are aligned with the extended heat exchange portions in an adjacent row.
16. The thermoelectric module of claim 14, wherein the extended heat exchange portions comprise fin members.
17. The thermoelectric module of claim 16, wherein the extended heat exchange portions comprise planar fin members.
18. The thermoelectric module of claim 1, wherein free ends of the hot sink array are connected by an electrically insulative cover.
19. A thermoelectric heat pump assembly for small cooling appliances, comprising:
a fan for generating a flow of cooling air;

a thermoelectric heat pump module comprising a plurality of spaced thermoelectric elements, the thermoelectric elements having first ends connected in pairs by electrically and thermally conductive cold-side connectors, the thermoelectric elements having second opposite ends connected in pairs by electrically and thermally conductive hot-side connector sinks having extended, spaced heat exchange portions forming a hot sink array, the cold-side connectors connected directly to and supported by a rigid, unitary cold sink, the thermoelectric elements and their connector sinks arranged in an elongated array of rows on the cold sink, the rows having a length greater than a width of the array;

the heat pump module being arranged relative to the fan to receive the flow of cooling air perpendicular to the elongated hot sink array.

20. The thermoelectric heat pump assembly of claim 19, wherein a second thermoelectric heat pump module is arranged relative to the fan to receive the flow of cooling air in a perpendicular fashion.

21. The thermoelectric heat pump assembly of claim 19, wherein one or more heat pump modules are arranged surrounding the fan.